CLAMP-JAW CONTACT ASSEMBLY AND METER SOCKET EMPLOYING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to contact assemblies and, more particularly, to a clamp-jaw contact assembly, such as for a watt-hour meter socket. The invention also relates to meter sockets employing clamp-jaw contact assemblies.

Background Information

Watt-hour meters are typically used by electric utilities to measure electrical consumption in residential, commercial and industrial applications. To accommodate the watt-hour meter, equipment is provided with a watt-hour meter socket. Such a meter socket contains a plurality of "meter jaws" to accept bayonet stabs or contacts on the base of the watt-hour meter.

Meter sockets having locking jaws for receiving the bayonet or blade contacts of a watt-hour meter are well known. See, for example, U.S. Patent No. 3,281,550. Meter sockets are generally located in a rectangular enclosure having an opening in a top panel for receiving line cables and an opening in a bottom panel for receiving load cables. The meter socket is mounted to a back panel of the enclosure. A removable front panel has an opening for receiving the dome portion of the meter, which extends therethrough when coupled to the meter socket.

A typical residential meter socket is of the "plug-in type" in which the bayonet stabs on the meter are retained and clamped to corresponding meter jaws using the inherent spring pressure of the meter jaws. For some residential applications, and for the majority of commercial and industrial applications, a "clamp-jaw" type of meter socket is employed. In the clamp-jaw type meter socket, the clamping force of the jaws upon the meter bayonets is enhanced by the addition of a spring, such as a straight beam spring or a coil spring.

In a typical construction, the meter jaw assembly includes a stationary jaw or contact, and a moveable or pivoting jaw or contact. The moveable jaw, with the aid of the aforementioned spring, exerts pressure on the corresponding meter bayonet, thereby clamping it to the stationary jaw.

U.S. Patent No. 5,775,942 discloses a meter socket employing a plurality of jaw-type contact assemblies including a stationary contact, a moveable contact and a conductor terminal.

Figure 1 shows a prior clamp-jaw assembly 2, which generally includes three component parts: a stationary contact 4 (as best shown in Figure 2), a moveable contact 6 and a conductor terminal (not shown). The stationary contact 4 is preferably a one-piece construction including an elongated body 8 and a generally unshaped bottom portion 10 having a vertical extension member 12 and a conductor terminal interface 13. The elongated body 8 includes a pair of wings 14, which extend perpendicular to the elongated body 8. Preferably, the stationary contact 4 is stamped and bent into shape from a single piece of conductive metal, such as copper.

The moveable contact 6 is pivotably mounted to the stationary contact 4 by a pivot pin 16. The moveable contact 6 is also preferably a one-piece construction. The moveable contact 6 includes a back portion 18 having a pair of wings 20 (only one of the wings 20 is shown) extending substantially perpendicular to the back portion 18. A low portion 22 of the moveable contact 6 is bent for receiving a biasing mechanism, such as a spring 24, to bias a portion 26 of the moveable contact 6 to be in a clamped position with respect to the elongated body 8 of the stationary contact 4.

Known technology for jaw-type contact assemblies typically employs both a spring and a separate machine driven tubular steel rivet to accomplish the respective clamping and pivoting actions. However, the rivet must be installed by a rivet setting machine or else staked manually, in order to retain the rivet in the jaw-type contact assembly. Also, a beam spring or coil spring is separately installed in that assembly in order to provide the desired clamping force.

There is room for improvement in clamp-jaw contact assemblies.

There is also room for improvement in watt-hour meter sockets and in meter socket clamp-jaw contact assemblies.

SUMMARY OF THE INVENTION

These needs and others are met by the present invention, which combines both spring clamping force and pivot functions in a unitary spring / pivot

member, which may be assembled in a meter socket clamp-jaw contact assembly without the need for a machine operation.

As one aspect of the invention, a clamp-jaw contact assembly comprises: a stationary contact adapted to engage a meter socket cavity; a moveable contact adapted to engage a meter bayonet; and a unitary member pivotally mounting the moveable contact to the stationary contact and adapted to bias the moveable contact toward the stationary contact.

The unitary member may be a U-shaped wire-form or a wire-formed member.

The unitary member may be a spring / pivot member having a rectangular shape with a pair of ends and an open portion therebetween.

The stationary contact may include an elongated body and a pair of sides, which extend from the elongated body; the moveable contact may include a body portion and a pair of sides, which extend from the body portion; the sides of the stationary contact and the moveable contact may have openings; the unitary member may be a spring / pivot member having a first end, which passes through a first pair of the openings of a first pair of the sides of the stationary contact and the moveable contact; and the spring / pivot member may have a second end, which passes through a second pair of the openings of a second pair of the sides of the stationary contact and the moveable contact.

The unitary member may be a spring / pivot member having a first end, a second end and an opening therebetween; the stationary contact may include first and second openings; the moveable contact may include first and second openings; the first end of the spring / pivot member may engage the first openings of the stationary contact and the moveable contact; and the second end of the spring / pivot member may engage the second openings of the stationary contact and the moveable contact.

The unitary member may be a spring / pivot member having a general U-shape including a pair of ends disposed from a pair of sides disposed from a bias member, with the pair of ends pivotally mounting the moveable contact to the stationary contact. The stationary contact may include a surface. The moveable contact may include a first portion, which is pivotally mounted to the stationary

contact, and a second portion proximate the surface of the stationary contact and adapted to be biased by the bias member of the spring / pivot member.

The stationary contact may be elongated and include a pair of protrusions. The sides of the spring / pivot member may engage the protrusions of the stationary contact. The moveable contact may pivot about the ends of the spring / pivot member. The second side of the second portion of the moveable contact may engage the bias member of the spring / pivot member, in order to maintain the moveable contact in a clamped position with respect to the stationary contact.

As another aspect of the invention, a meter socket clamp-jaw contact assembly comprises: a stationary contact; a moveable contact; and a unitary spring / pivot member pivotally mounting the moveable contact to the stationary contact and adapted to bias the moveable contact toward the stationary contact.

As another aspect of the invention, a meter socket comprises: a socket block including a plurality of cavities recessed therein; and a plurality of clamp-jaw contact assemblies mounted in the cavities of the socket block, each of the contact assemblies comprising: a stationary contact engaging a corresponding one of the cavities; a moveable contact adapted to engage a meter bayonet; and a unitary member pivotally mounting the moveable contact to the stationary contact and adapted to bias the moveable contact toward the stationary contact.

BRIEF DESCRIPTION OF THE DRAWINGS

A full understanding of the invention can be gained from the following description of the preferred embodiments when read in conjunction with the accompanying drawings in which:

Figure 1 is an isometric view of a watt-hour meter clamp-jaw assembly.

Figure 2 is an isometric view of the stationary contact of Figure 1.

Figure 3 is an isometric view of a watt-hour meter clamp-jaw assembly in accordance with the present invention.

Figure 4 is an isometric view of the spring / pivot member of Figure 3.

Figure 5 is an isometric view of the moveable contact of Figure 3.

Figure 6 is an isometric view of the watt-hour meter clamp-jaw assembly of Figure 3 prior to the assembly of the spring / pivot member of Figure 4.

Figure 7 is a cross-sectional view of a meter socket assembly as taken through three load end clamp-jaw contact assemblies, including the clamp-jaw assembly of Figure 3, in accordance with an embodiment of the present invention.

Figure 8 is an isometric view of a watt-hour meter clamp-jaw assembly in accordance with another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is disclosed in connection with a clamp-jaw assembly for a watt-hour meter socket assembly. However, it will be appreciated that the invention is applicable to a wide range of clamp-jaw contact assemblies, which provide electrical connection to bayonet stabs, contacts or other types of electrical connections.

Referring to Figure 3, a clamp-jaw assembly 30 of the present invention is shown. The clamp-jaw assembly 30 is suitable for use with a watt-hour meter socket, such as the meter socket assembly 72 of Figure 7. An example of such a watt-hour meter socket is disclosed in U.S. Patent No. 5,775,942, which is incorporated herein by reference. The assembly 30 includes a stationary contact 32, which is somewhat similar to the stationary contact 4 of Figure 2, a moveable contact 34 (as best shown in Figure 5) and a spring / pivot member 36 (as best shown in Figure 4). The stationary contact 32 is preferably a one-piece construction including an elongated body 40 and a generally unshaped bottom portion 42 having a vertical extension member 44. The stationary contact 32 includes a pair of wings 46, which extend perpendicular to the elongated body 40 thereof. Preferably, each of the stationary contact 32 (*e.g.*, made of copper) and the moveable contact 34 (*e.g.*, made of copper or heat treated steel) are stamped and bent into shape from a single piece of conductive metal. As shown in Figure 4, the spring / pivot member 36 is preferably formed from a suitable structure, such as a wire 37 (*e.g.*, made of spring steel), which is bent into a square or rectangular shape having a pair of ends 47,48 with an open portion 49 therebetween.

The moveable contact 34 is pivotably mounted to the stationary contact 32 by the ends 47,48 of the spring / pivot member 36. The moveable contact 34 is also preferably a one-piece construction. The spring / pivot member ends 47,48 pass through openings 50 (only one opening 50 is shown in Figures 3 and 6) of the wings

46 of the stationary contact 32. The moveable contact 34 includes a back portion 52 and a pair of wings 54 extending substantially perpendicular to the back portion 52. The spring / pivot member ends 47,48 also pass through openings 56 of the wings 54 of the moveable contact 34. An arcuate low portion 58 of the moveable contact 34 is engaged by a low portion 60 of the spring / pivot member 36, in order to provide a clamped position (as best shown in Figure 7) of the moveable contact 34 with respect to the stationary contact 32 after insertion of a meter bayonet 64 (as shown in phantom line drawing) therebetween. The center V-shaped portion of the moveable contact 34 minimizes bending or deformation of such contact.

Figure 6 shows the relative positions of the stationary contact 32 and the moveable contact 34 before the assembly of the spring / pivot member 36 of Figures 3 and 4. The moveable contact 34 is first positioned between the wings 46 of the stationary contact 32. Then, with reference to Figure 3, the low portion 60 of the spring / pivot member 36 is moved past the arcuate low portion 58 of the moveable contact 34 and proximate the opposite surface 66 thereof. Finally, the ends 47,48 are inserted within the corresponding openings 50 and 56 of the respective contacts 32 and 34.

As shown in Figures 3, 6 and 7, unlike the wings 14 of the stationary contact 4 of Figure 1, there are one or more protrusions 62 on the wings 46 of the stationary contact 32. As best shown in Figure 7, these protrusions 62 bias the wire spring / pivot member 36, in order that the stationary and moveable contacts 32,34 are biased closed against the meter bayonet 64 (as shown in phantom line drawing). With the meter bayonet 64 in the position shown in Figure 7, the moveable contact 34 pivots counter-clockwise (with respect to Figure 7 and with respect to the bottom right of Figure 3) about the ends 47,48 of the spring / pivot member 36. In turn, a surface 66 of the arcuate low portion 58 of the moveable contact 34 engages the low portion 60 of the spring / pivot member 36. As a result, upper portions 68 of the sides 69 of the spring / pivot member 36 engage the protrusions 62 of the wings 46 of the stationary contact 32. The low portion 60 of the spring / pivot member 36, thus, provides the bias to the arcuate low portion 58 of the moveable contact 34, in order to maintain the moveable contact 34 in a clamped position with respect to the stationary contact 32, with the respective surfaces 59 and 70 clamping the meter bayonet 64 as

shown in Figure 7. No additional parts are required to complete the clamp-jaw assembly.

Figure 7 shows a cross-sectional view taken through load end clamp-jaw contact assemblies 30,30′,30′ of a meter socket assembly 72 formed in accordance with the present invention. The contact assemblies 30′ are similar to the contact assembly 30, except that they provide a mirror-image, as shown. An insulative base or socket block 74 of the meter socket assembly 72 includes a series of cavities 76 recessed into the block for receiving each of the contact assemblies 30,30′,30′. These contact assemblies are bolted to the socket block 74 using screws 78 inserted into openings 79 in a bottom portion of the block and into openings 90 (as shown in Figure 3) of the contact assemblies.

Referring to Figure 8, another clamp-jaw assembly 80 is shown. The assembly 80 includes a stationary contact 82, which is somewhat similar to the stationary contact 32 of Figure 3, a moveable contact 84, which is somewhat similar to the moveable contact 34 of Figure 3, and a spring / pivot member 86, which is somewhat similar to the spring / pivot member 36 of Figure 3. Here, unlike Figure 3, but like the contact assemblies 30′ of Figure 7, the stationary contact 82 has a conductor terminal interface 88, which is located on the opposite side (*i.e.*, toward the top left of Figure 8 rather than conductor terminal interface 89, which is located on the bottom right of Figure 3) of the clamp-jaw assembly 80. Also, the spring / pivot member 86 has bend portions 91, which accommodate a relatively wider meter bayonet (not shown) than the meter bayonet 64 of Figure 7.

The disclosed watt-hour meter clamp-jaw assemblies 30,30′,80 eliminate a separate rivet and the resulting staking operation. A pivot mechanism is provided by shaping the spring / pivot member 36 from the wire 37, in order to provide both a pivot / clamping mechanism as well as suitable spring force in order to securely clamp the meter bayonet 64 to the surface 70 of the stationary contact 32 by the surface 59 of the moveable contact 34. The openings 50 and 56 on both the stationary and moveable contacts 32 and 34, respectively, provide a retaining mechanism for the ends 47,48 of the wire spring / pivot member 36.

Counter-clockwise rotation (with respect to Figure 7) of the moveable contact 34 as caused by the insertion of the meter bayonet 64 between the surface 70

of the stationary contact 32 and the surface 59 of the moveable contact 34 causes the arcuate low portion 58 of the moveable contact 34 to disengage from the vertical extension member 44 of the stationary contact 32. This causes the upper portions 68 of the spring / pivot member 36 to be deflected by the protrusions 62 of the wings 46 of the stationary contact 32, which bends the member 36 and causes the low portion 60 of the spring / pivot member 36 to provide the bias (counter-clockwise with respect to Figure 7) to the arcuate low portion 58 of the moveable contact 34. As a result, this clamps the meter bayonet 64, which is sandwiched between the surface 59 of the moveable contact 34 and the surface 70 of the stationary contact 32.

While specific embodiments of the invention have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are meant to be illustrative only and not limiting as to the scope of the invention which is to be given the full breadth of the claims appended and any and all equivalents thereof.